CHARGETEK

D-Series

Versatile and Rugged Lithium Ion/LiPO Industrial Charger Series

- • **California Energy Compliant**
- • **Rugged and reliable design**
- • **Capable of direct charge or BMS**
- • **Power phase-back with temperature**
- • **Wide operating temperature range**
- • **Transient protected input/output**
- • **Active I/O reverse polarity protection**
- • **Informative LED display**
- • **Optional wireless/digital interface**
- • **Relay and discrete I/O signals**
- • **Over temp protection with auto reset**
- • **Overcurrent / overvoltage protected**
- • **Four year warranty**

Description

The D-series is an environmentally robust and sophisticated battery chargers with models supporting Lithium or LiPo batteries. With a wide operating temperature range (-25°C to 65°C), a rugged mechanical design, and AC or DC input power options, this product is well suited for high end industrial applications. The charger complies with the California Energy Commission guidelines and with UL/CSA specifications.

The D-series product line has variable fan speed control algorithm. This provides extremely high power density while minimizing audible noise in low power conditions.

The D-series optional external communications can be programmed with user specific firmware. The product may be ordered with an optional user defined set of discrete I/O signals, a wireless option, an RS-232 or RS-485, CAN or other interfaces.

An informative LED display indicates state of charge, input power present, battery voltage and current, fault conditions and proper battery connection are standard. The D-series charger precisely controls the charging algorithm to insure a complete recharge while prolonging battery life. The charger can be programmed for direct pack charging, an SMBus interface or with a BMS (battery management system) equipped pack.

The D-series can be connected indefinitely making it ideal for remote and standby applications. It is mountable in any orientation and can be ordered with input and output power connectors per customer specification. Customized charging algorithms, power sequencing and control/monitoring options are available upon request.

AC input model specifications

PARAMETER	DESCRIPTION / CONDITIONS
AC input voltage range	3 input ranges covering 85 VAC - 280 VAC
Input AC amps (max)	Measured at 85 VAC / 800 watts output: 13 Arms without PFC
AC input configuration	AC input: line, neutral , chassis ground
Connector	IEC-320

DC input model specifications

PARAMETER	DESCRIPTION / CONDITIONS
DC input voltage range	8 input ranges covering 11 VDC to 500 VDC
Input DC amps (max)	Measured at 40 VDC / 800 watts output: 23A
DC input configuration	DC input: DC Power, DC Return, Chassis ground
Connector	Anderson PP-75 or user defined

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Rev C 6/10/17

D-Series Model Specific Specifications

Lithium-ion/LiPO battery charging curve

A three stage charge routine which is recommended by lithium-ion and LiPO battery manufacturers is described below.

Stage 1: Precharge. If the battery is deeply discharged, a precharge of approximately 300 mA is applied until the voltage is 2.8 volts/cell.

Stage 2: Constant current mode. The charger provides constant current until the battery voltage is V_{tpf} volts/cell.

Stage 3: Top off mode. This is the final stage of the charging routine. The battery voltage is maintained at approximately V_{tpf} volts/cell. When the charging current decreases to 300 mA, the charge is terminated until the next discharge cycle.
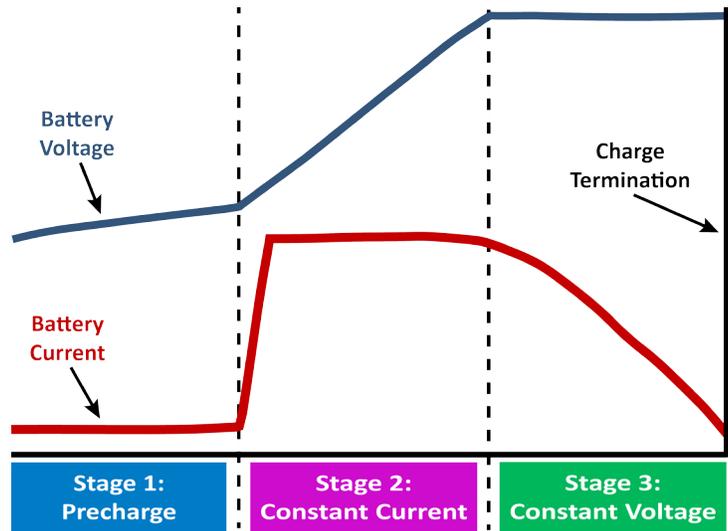
Standard LED indicators

PARAMETER	GREEN	RED/GREEN	RED	RED on/off	GREEN on/off
state of charge	Complete	Top Off	Constant Current	-	-
battery voltage (volts)	< 75% of V_{tpf}	75% to 85% of V_{tpf}	85% to 95% of V_{tpf}	> 95% of V_{tpf}	-
battery current (amps)	< 10% of I_{max}	10% to 30% of I_{max}	30% to 90% I_{max}	> 90% of I_{max}	-
fault indicator	Polarity OK	Short/Reversed	Battery < 2.7V/cell	Over Voltage	Over Temperature
input power	Power Good	-	-	-	-

D-Series Lithium/LiPO Charger Common Specifications

CHARGING PARAMETERS	DESCRIPTION
Termination current (I_{trm})	500mA +/- 50mA
Termination transition timeout	3 hours
Minimum battery start voltage	2.5V/cell
Standby battery drain	<400uA with input power off
Termination V_{bat} rate (dv/dt)	V_{bat} < 0.9 * V_{tpf} , I_{bat} > 0.5A, dv/dt < 200mv/hour
Max charging time	Terminate if > I_{max}/3 > 15 hours
Overvoltage protection	Maximum Charging Voltage + 1.0V
Output noise and ripple (PARD)	<150mV, 100MHz BW
Regulation	$\pm$ 0.5%
Efficiency	Minimum 80% at max load

D-Series Lithium/LiPO Charger Ordering Guide, p/n abD-*xyz-r*

P/N Field	Definition	Options	Description
a	Battery Chemistry	T - Lithium L - LiPo	Battery Chemistry
b	Input Power	A - AC input E - DC input	See description of field z in the part number for input voltage range options.
x	Number of Series Cells Defines the output voltage.	The options are: **3S, 4S, 5S, 6S, 7S, 8S, 10S, 12S, 14S, and 18S**	This option defines the Maximum Charging Voltage. For Lithium and LiPO based chargers the maximum output voltage is the number of cells multiplied by maximum cell voltage of 4.2V. For example, 3S would specify a 12.6V charger.
y	Maximum Charging Current	Maximum Charging Current in amps. For standard model the maximum charging current is determined by the number of Series Cells, see tables to the right. If a *lower* maximum output current is desired then it is specified in this field as amps. For example a standard AC input Lithium 4S model is ordered as TAD-S440-1. If a charger with a maximum output current of 30 amps is needed the order number would be TAD-S430-1.	**Maximum Charging Current vs. Number of Series Cells** Series Cells / Max. Current 3S / 50 Amps 4S / 40 Amps 5S / 32 Amps 6S / 27 Amps 7S / 23 Amps 8S / 20 Amps 10S / 16 Amps 12S / 13 Amps 14S / 11 Amps 18S / 9 Amps

Maximum Charging Current vs. Number of Series Cells

Series Cells	Max. Current
3S	50 Amps
4S	40 Amps
5S	32 Amps
6S	27 Amps
7S	23 Amps
8S	20 Amps
10S	16 Amps
12S	13 Amps
14S	11 Amps
18S	9 Amps

P/N Field	Definition	Options	Description
z	Input voltage range	For AC input chargers, three options; 01, 02, and 03 are available For DC input chargers, eight options; 07, 08, 09, 10, 11, 12, 13, and 14 are available.	**Input Voltage Range Options**

Input Voltage Range Options

Option	Input Voltage Range	Option	Input Voltage Range
01	85 - 140 VAC	09	30 - 50 VDC
02	180 - 300 VAC	10	38 - 75 VDC
03	85 - 300 VAC	11	72 - 140 VDC
07	11 - 20 VDC	12	100 - 200 VDC
08	18 - 36 VDC	13	150 - 300 VDC
		14	250 - 500 VDC

P/N Field	Definition	Options	Description

r	Options	List of Available Options, listed separated by '-' characters, some options are mutually exclusive.
		
		An: External Interface
		Rxy: Internal Relay
			An: External Interface, choose n as follows:
			   0 - RS-232, 1 - RS-485, 2 - Wired Ethernet, 3 - CAN,
			   5 - Wireless Ethernet, 99 - Special
			Rxy: Internal Relay, there can be up to 4 internal relays
			   x = relay configuration; O for NO, C for NC
			   y = function; 1 - Over voltage, 2 - Charging,
			                 3 - Over temperature, 4 - AC On

Example: TAD-S627-01-RA1-RC3-RO4 specifies a Lithium(T), AC input(A) charger with maximum output voltage set to charge 6-series cells (S6) at a maximum current of 27 amps (27) and the AC input range is 85-140 VAC (01). The chargers has options for an RS-485 interface (RA1) with two relays, NC Over Temperature (RC3) and NO AC On (RO4)

Certifications and Compliance (model dependant - consult factory)

a	UL CSA
b	CE mark
c	California Energy Compliant
d	RF emissions: US FCC Part 15 Class A, CISPR 22:2009
e	IEC 555, power factor
f	IEC 61000-4-5; Class 4 Severity Level, Surge
g	IEEE C2-2012 National Electrical Safety Code
h	NFPA 70-2014 National Electric Code
i	IEC 60950 Safety of IT Equipment; Pollution Degree 2
j	WEEE and Restriction of Hazardous Substances (ROHS) Directives 2002/95/EC
k	T-Mark

Workmanship specifications

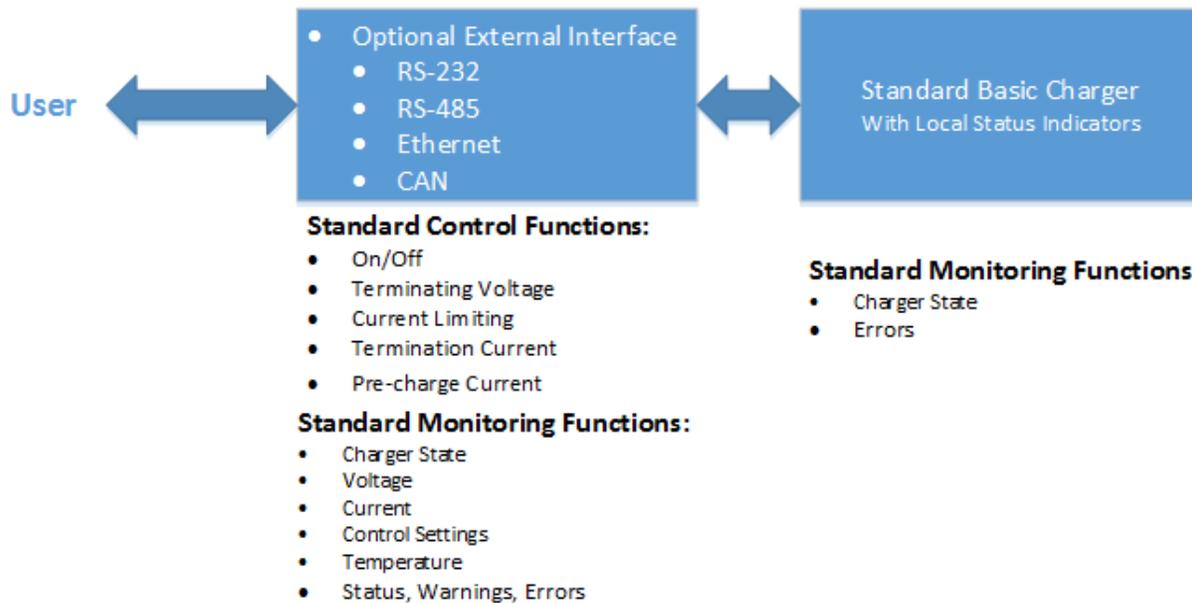|	
IPC-610	Acceptability of electronic assemblies IPC J-STD-006 Requirements for electronic grade solder alloys and fluxed and non-fluxed solid solders for electronic soldering applications
IPC-2221	FR4, 130C 94V-0
IPC/WHMA-A-620	Requirements and acceptance of wiring and cabling

Mechanical specifications

PARAMETER	(units are in inches and pounds)
Dimensions	9.24 (L) x 5.00 (W) x 2.2 (H)
Chassis material	Aluminum
Chassis finish	Black anodized
Clearance	12 inches all sides
Mounting	#6 screws at six locations
Output connector	Molex P/N:0768250006 (X4)
Fan connector	Not accessible
Weight	Six pounds
Fan noise during full-speed operation	< 70dBA

Environmental specifications

PARAMETER	DESCRIPTION / CONDITIONS
Operating environment	Office environment (in plenum where applicable)
Storage temp.	-40°C to +80°C
Operating temp.	-20°C to +60°C at maximum output over entire DC voltage range
Humidity	0°C to +95°C relative humidity (non-condensing)
Operational altitude	10,000 feet
Vibration	MIL-STD-810 or IEC60068-2-6 and -2-64 as applicable
Shock	MIL-STD-810 or IEC60068-2-27 as applicable
Isolation	Input - chassis: 2KVDC Input - output: 2KVDC Output - chassis: 500VDC
DC leakage current	Input - chassis: < 200uA at 2KVDC Input - output: < 100uA at 2KVDC
AC leakage current	< 3.5mA at 264VAC, 60Hz

Control and monitoring

Control and Monitor Interfaces

User ⟷

- Optional External Interface
  - RS-232
  - RS-485
  - Ethernet
  - CAN

⟷ Standard Basic Charger
With Local Status Indicators

Standard Control Functions:
- On/Off
- Terminating Voltage
- Current Limiting
- Termination Current
- Pre-charge Current

Standard Monitoring Functions:
- Charger State
- Voltage
- Current
- Control Settings
- Temperature
- Status, Warnings, Errors

Standard Monitoring Functions:
- Charger State
- Errors

Outline and mounting

14 AWG   10 AWG

4*6-32UNC

5 [127]

9.291 [236]

4.291 [109]

0.354 [9]

0.394 [10]   8.11 [206]

2.165 [55]

Dimensions in inches (mm)